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The impact of risk attitudes on micro-enterprise performance:

Evidence from urban markets of Maputo, Mozambique

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Abstract:

Sound policies to promote private sector growth in developing countries are of crucial importance to create employment and fight poverty. Despite the fact that microenterprises are the most common type of business in low income countries, little is known about the determinants of microenterprise survival and growth. Although risk attitudes have been shown to be an important determinant of entrepreneurship, their relationship with business growth and success remains unclear. To examine this relationship, we use a novel dataset collected among urban micro-entrepreneurs in Mozambique, including an empirically validated risk measure. We find that risk attitudes are strongly correlated to microenterprise revenues and costs, and also with business practices regarding stock management. Our findings imply that risk loving entrepreneurs are more likely to grow their businesses relative to their risk averse counterparts.

JEL classification : D22 ; D81 ; L25 ; L26 ; O12.

Keywords: Risk Aversion, Microenterprises, business performance; business growth.

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1. Introduction

Micro and small enterprises (MSEs) in low income countries have gathered extensive attention in recent years. Indeed, many researchers and organizations have recognized the crucial role MSEs play on employment, household income and economic activity.[2] In order to magnify these positive effects, government and international organizations target policies that enhance the survival and economic performance of those MSEs.

One challenge in designing these policies is that it is difficult to obtain reliable data on the weight that MSEs have in their economies, mainly due to a still very prevalent informal sector in most developing countries. Despite this, academics and researches have underlined their importance on their respective economies. Gamser (2003), states that the share of GDP MSEs contribute to is underestimated due to the aforementioned reasons, he affirms MSEs contributed not to the officially reported 14 percent of GDP but in fact to as much as 40 percent of Kenya's GDP in 2003. Additionally, and while MSEs are also very present in developed countries, Tybout et al (2000) show that the share of overall employment in MSEs is higher in developing countries than in developed countries. Finally, Sutton (2014), in a detailed overview of the Mozambican economy, shows that in most sectors, behind major industrial players and exporters that account for most of its GDP, there are many MSEs and SMEs employing a large share of the population that are struggling to develop.

In this context, understanding the drivers of microenterprises growth and success in developing countries seems of key interest. Batista, Sequeira and Vicente (2016) work with a sample similar to ours, of 1200 micro entrepreneurs in the greater Maputo area in Mozambique, and show that business skills seem particularly relevant for microenterprise performance, in absolute terms and relative to the provision of savings capacity. While this existing literature

[2] See for example Daniels and Mead (1998), Daniels (1999), or Liedholm (2002).

highlights the role of business trainings, education and credit provision on microenterprise survival and performance, the role of unobservable firm characteristics, such as the owner's risk preferences, have not yet been studied in the current economic literature.[3]

There is a number of studies showing that risk attitudes are closely related to entrepreneurship. This relationship can be understood in light of existing economic theory, according to which the income generated by self-employment is more volatile and uncertain than the income generated through salaried work. Thus entrepreneurs may be expected to be more risk tolerant than salaried workers (Kihlstrom and Laffont, 1979). This theoretical hypothesis has been empirically supported by a variety of studies, including Caliendo et al. (2009), Cramer et al. (2002), and Stewart and Roth (2001). Batista and Umblijs (2014), using different risk aversion measures, also provide evidence that less risk averse immigrants tend to engage more in entrepreneurial activities. Although surely relevant, these findings do not examine whether and how risk preferences matter for business performance, namely in terms of survival rates, growths, profits, structure of costs and revenues, as well as employment creation and child labor.

The main research question of this paper is precisely to investigate whether and how risk attitudes influence business outcomes of micro-enterprises, through a number of different mechanisms. To answer this research question, we use the data from Batista and Seither (2016) for a sample of about 500 microenterprises in the greater urban area of Maputo, in Mozambique. We find that risk attitudes are strongly correlated to microenterprise revenues and costs, suggesting that risk attitudes matter for business development. We also find that risk attitudes

[3] See among others Bloom et al (2010), Karlan and Zinman (2011), McKenzie and Woodruff (2013), Drexler et al. (2014), and Queiro (2016).

are correlated with business practices regarding stock management. We do not however find any relationship between risk attitudes and firm performance, as measured by profits.

The remainder of the paper is organized as follows. Section 2 reviews the main results found in the literature on the relationship between risk preferences and business performance. Section 3 extends an existing theoretical framework to model the impact of risk attitudes on the business decisions implemented by micro-entrepreneurs in a developing country. Section 4 describes the empirical methodology used, while Section 5 presents the data and the descriptive statistics. Finally, Section 6 discusses the empirical results, and section 7 concludes.

2. Literature Review

Our work is related to four different strands of literature.

The first strand of literature is the literature on MSEs in developing countries. Several academics and policy makers have expressed concerns over the motives why MSEs are so prevalent. Indeed, while some observers state that this kind of entrepreneurship shows that the economy is functioning as even the lower-income individuals are able to play a part in the economy as entrepreneurs, the overwhelming majority of academics and policy-makers are more skeptical. Indeed, as discussed by Liedholm (2002), this prevalence may highlight the incapacity of governments in providing the necessary conditions for businesses to grow and hire employees. As a result, some entrepreneurs might be forced into business ownership due to a lack of any other productive employment opportunities. In any event, it seems key for economic development in those countries to increase the level of productivity of microenterprises, be it through improving survival and business expertise, or through economies of scope and scale, in order to employ more people and achieve better returns. According to Liedholm (2002), only 2 percent of the businesses they surveyed in Africa had actually more than 10 workers thus at least classifying as a small enterprise, the other 98 percent

classified as micro-enterprises. Another study led by Fajnzylber et al (2006) showed that only 12 percent of one person led microenterprises do expand but also that larger micro-enterprises have a higher probability of contracting than expanding over the course of one year. Finally, Sutton (2014), in his report, makes a sector by sector in depth study of the economy of Mozambique and highlights the gap between major industrial multinationals whose benefits for the global population remains unclear and MSEs not being able to grow. There is thus a great challenge for policy makers in Mozambique to promote SMEs growth in order to fill the gap between multinationals and small-scale micro-entreprises.

A different strand of related literature is Psychological research. Indeed, Psychological research so far is the only kind of research that has deeply focused on personality traits of entrepreneurs and their relation to business success. Krauss et al. (2005) made use of a framework by Lumpkin et al (1996) to study the relationship between each individual's *Entrepreneurial Orientation* (see Lumpkin et al (1996)) and business performance for a sample of 248 southern African business owners. They find that a risk taking orientation had no effect on the number of employees, but had a positive (although weak) impact on business growth. However, Rauch and Frese (2000) provide an overview of findings suggesting that low risk taking is associated with success, but with small coefficients. Begeley and Boyed (1987) found that risk taking predicted success but only up to a certain point, after that it had a negative effect on business performance. This is in line with the paper from Timmons et al (1985) written two years before. Chell et al (1991) continue with this line of thought by suggesting that "becoming an entrepreneur is risky but doing business in a risky way might be dangerous."

Additionally, Willebrands et al. (2012) in a recent study similar to ours among small enterprises in Lagos, Nigeria, find that there is no robust support for a relationship between risk attitudes and business success. They find, however, that the perception of risk does have a positive significant effect on business performance. The strength of this contribution is the fact

that they make a distinction between risk attitudes and risk perceptions. Nevertheless, using only revenues as the only variable measuring business performance is not optimal as risk attitudes of micro-entrepreneurs should first affect the firm's cost structure through investments before affecting the revenues. Ultimately, business performance is measured through profits and they do not test the relationship between risk attitudes and profits in their analysis.

Another crucial strand of literature for our analysis is the literature concerned with measuring risk attitudes in an objective, precise and comparable manner. Economists have long been skeptical about the precision of using survey question in order to determine the real risk attitudes of respondents (Krauss et al (2005)). Chell et al (1991) highlighted the fact that studying risk attitudes is tricky as inconsistencies in findings might be due to the differences in risk measurements rather than differences in results i.e. what is considered risky by some researchers or business owners might not be for others and this can hinder objective comparability across findings. Nevertheless, in recent years, the measurements of risk attitudes have substantially improved. Dohmen et al (2011) using German Socio-Economic Panel (SOEP) sample and complementing it with a field experiment of 450 subjects drawn using the exact methodology as the SOEP, find the general risk question ("How are you willing to take risks in general?") to be a reliable measure of risk attitudes in comparison with the risk attitudes measured with a paid lottery. They further study the interaction between a hypothetical lottery and the general risk question and find that they are strongly correlated, thus validating the use of a hypothetical risk question as a credible risk measurement .Batista and Umblijs (2014) also use an hypothetical lottery risk question, and compare its measurement performance with that of hypothetical risk vignettes, which they find a superior measurement strategy as it enables correction for differences in subjective risk measurement scales which are shown to vary systematically especially among individuals with different backgrounds.

Finally, the last strand of literature of interest is economic research on risk attitudes and its relationship to business performance. While the relationship between entrepreneurship and risk tolerance has been established theoretically and empirically using different measurement techniques and in various settings, the impact of risk attitudes on firm performance itself has been clearly understudied in the economic literature. Previous economic research pays little attention to the role of risk attitudes on business performance. One notable recent contribution nonetheless is the work of Caliendo et al (2010). They test the inverse U shaped relationship between risk attitudes and firm survival that Chell et al (1991), suggested. The inverse U shaped relationship theory can be summarized as follows: the more risk averse entrepreneurs have trouble investing in their companies. They do not make the appropriate investment due to their risk aversion. The returns they make from their investments are thus low leading their businesses to struggle to compete with their competitive environment. This in turns increases their likelihood of going out of business. While the very risk averse do not dare to make the necessary investment, the very risk tolerant on the contrary make too many investments that are too risky leading them to probable bankruptcy. Thus this creates an inversed U shaped curve relationship between risk attitudes and firm survival.

Caliendo et al (2010) finds evidence of this theory using the German Socio-Economic Panel (SOEP) which is a representative panel survey. This is the same survey Dohmen et al (2011) validated their various risk measurements with and Caliendo et al (2010) rely on their work by using the hypothetical lottery question. They use the yearly outcomes for the years 2000 to 2005 and find evidence of the inversed U shape relationship suggested by Chell et al (1991). One could however question the relevance of this finding for private sector development in developing countries as surviving firms do not mean successful and prosperous business entities.

3.Theoretical Framework

In order to understand the role of risk preferences in shaping business attitudes, we propose a theoretical framework that builds on the model by Caliendo et at (2010). We start by defining the following initial investment *I* function:

$$I(p; y_s) \tag{1}$$

where $p \epsilon (0; 1)$ is the probability of success of this investment and $y_s > 0$ is the potential gross payoff of the investment in case of success. Investment *I* implies a fixed cost y_s/c which is a fraction of the potential payoff. For simplicity, we assume that investments can either be a success with a payoff of $y = y_s - y_s/c$ or a failure with a loss of $y = -y_s/c$.

Furthermore, Equation (2) shows the expected return of investing, while Equation (3) shows its variance. The interaction between the two is displayed in Equation (4).

$$E(y) = py_s - y_s/c \tag{2}$$

$$Var(y) = p(1-p)y_s^2 \tag{3}$$

$$Var(y) = p(1-p)\left(p - \frac{1}{c}\right)^{-2}[E(y)]^2 \tag{4}$$

We assume that the expected returns on investment increase with their riskiness and that these investments are subject to decreasing returns to scale as the level of risk involved increases as shown in Equation (5) and (6) below.

$$\frac{dE(y)}{dVar(y)} > 0 \tag{5}$$

$$\frac{d^2E(y)}{dVar(y)^2} < 0 \tag{6}$$

The scale of the investment is directly depending on risk attitudes. Based on their risk preferences, micro-entrepreneurs maximize their investment level as shown by Equation (7), considering a linear increasing function in r representing the risk attitudes of the entrepreneurs.

$$\max I(p; y_s) \quad (7)$$

$$s.t. \;\; y_s(r)$$

It is also assumed that every investment lasts one period of time at the end of which the entrepreneur learns whether the investment was a success or not. At the end of each period, the entrepreneur decides if he wishes to continue his business activities or not. To make a decision, he compares the expected revenues of the next investment possibility to the opportunity cost of staying in business. The opportunity cost of staying in business w^* can be interpreted as the salaried wage the entrepreneur can earn if he finds salaried work, or any available unemployment benefits. As displayed in Equation (8), the entrepreneur will only keep pursuing his business activities if the expected return of the investment is higher than the opportunity cost:

$$E(y) > w* \quad (8)$$

This is how Caliendo et al (2010) explain how firms managed by risk averse entrepreneurs have a lower rate of survival than their more risk tolerant counterparts. Entrepreneurs embark on small scale investments that lead to lower return. The return from those small-scale investments is therefore likely to be smaller than the opportunity cost of self-employment as the scale of the investment depends solely on a linear increasing function with r. If this is the case, the entrepreneur will close his business and opt for salaried work or unemployment benefits as this is a rational decision.

Even though Caliendo et al. (2010), using the German Socio-Economic Panel (SOEP), found supportive evidence that the more risk averse entrepreneurs do have a lower survival rate relatively to more risk loving counterparts,[4] we believe their results are not directly applicable to micro-enterprises in low income countries. The big incompatibility comes from the opportunity costs *w**, which in Germany may correspond to the earnings of alternative job offers or to unemployment benefits. These opportunity costs do not exist in most developing countries. Unemployment benefits are inexistent and finding salaried work is very hard. We therefore argue that *w** is effectively 0 in our context. This assumption implies that the risk averse micro-entrepreneurs stay in business due to a lack of alternatives. As a consequence, using the survival rates of microenterprises to proxy for business growth and business success does not seem a good strategy to examine their relationship with risk preferences. Instead, we expect to find strong positive relationships between our risk preference measure and business outcomes.

More specifically, the testable predictions implied by our theory are as follows:

-Investment, such as the purchase of products, and risk attitudes should be positively correlated as the more risk tolerant entrepreneurs are likely to invest more as they choose a higher y_s.

-Overall cost of the business should be positively correlated with risk attitudes as they are an indicator of business size and thus of y_s as well.

-The size of the existing stock of products should also be correlated with risk attitudes. A higher stock size can be considered risky as the chance of unsold products increases with stock size. Stock size is also de facto subject to a previous investment based on y_s.

[4] They also find that the most risk lover individuals also have a lower probability of survival due to a higher than average probability of bankruptcy.

-The aggregate costs should mechanically affect aggregate revenues in the way that the increased purchase of goods should increase sales as the entrepreneurs have more products to be sold, and thus risk attitudes should be positively correlated with revenues as well.

3. Data Description

We use data from the Batista and Seither (2016) project collected in Maputo, Mozambique, in 2016. More specifically, we make use of the baseline survey that was implemented between July and September 2016.

Data collection efforts started with a census of 3163 market vendors that was implemented across 33 urban markets in Maputo and Matola. The exclusion restrictions for vendor eligibility were the following: (i) participants had to be Mozambican, (ii) less than 50 years old, (iii) had to express the intention to keep their business activities for at least one year; (iv) wholesale vendors, restaurants, bars, fruits and vegetables sellers were excluded, as well as illegal vendors; (v) participants had to be officially registered and pay a market fee. The eligible participants of the project were then chosen randomly from this restricted census sample. Our final sample includes a total of 430 observations.

Concerning risk preference measurement, we use the same hypothetical lottery measure as Caliendo et al. (2010), which was validated by Dohmen et al (2011). Based on this finding, participants in the project were asked to answer the following theoretical question: *"Imagine that you won a present of a 1000 meticais without any indication on how to spend this amount. We give you an opportunity to use this money in a game. In this game, you can win or lose. Normally, out of 10 persons that play this game, 5 of them win and 5 of them loose. If you win, you keep 150% of the value invested in the game (keep 1500 meticais if you invested 1000). If you lose, you lose half of what you invested (keep 500 meticais if you invested 1000) within a year as well. How much would you like to invest in this risky but potentially lucrative game?"*

Participants could invest from 0 to 1000 meticais with steps of 100 meticais. This is exactly the theoretical lottery question used in the SOEP German panel survey and validated by Dohmen et al (2011) but adapted to the Mozambican context.[5]

Consequently, and following the approach of Caliendo at all (2010), we classify as "Risk Averse" respondents that answered that they would invest 0, 100 and 200 meticais in the lottery. Respondents that answered from 800 to 1000 meticais were classified as "Risk Loving". All remaining responses were classified as "Risk Neutral".

Questions regarding the business outcomes were organized as follows: participants were asked to list all their sales over the last seven days starting with the day of the interview and going backwards from there. After asking for these weekly revenues, we asked about monthly sales in general. This procedure was also performed to measure business costs, but respondents were also asked to categorize costs into five categories (Personal Transportation Cost, Product Transportation Cost, Purchase of Products and Materials, Employees expenses and Fees and other operational costs). The reason behind this detailed reporting strategy is that accounting is very poorly done by the micro-entrepreneurs selling in these urban markets. A strong majority of entrepreneurs do not keep written record of their sales and revenues and do not separate personal and family expenses than business expenses. Therefore, it is difficult for some respondents to answer these questions appropriately. By asking them to think about weekly sales and costs first we hope to get the most accurate measures of monthly costs and revenues which are our main outcomes variables in our analysis.

We also build a profit variable from the data of the monthly revenues and total monthly costs. The survey does not ask about profits directly. This would be in our eyes information of little value as many micro-entrepreneurs do not make formal written accounting and thus

[5] In the SOEP panel, the same question with the same probabilities was used but with a present of 100 000€. This measure was also used by Caliendo et al (2010) to reach their conclusions.

subtracting total costs from total revenues might give a better yet noisy estimate. Besides the risk measurement and revenues, costs and profits, we use a variable evaluating the stock size of respondents in days.[6] We further make use of the Age of their business, the type of business[7], the age of the entrepreneur, the level of education of the entrepreneur, the number of employees working for the respondent and a poverty level variable measured by the monthly spending's of the family of the entrepreneurs divided by the number of family members.

4. Identification Strategy

We estimate our model with OLS using the following regressions:

$$Y_i = \alpha_i + \beta_1 N_i + \beta_2 X_i + \varepsilon_i \quad (10)$$

where Y_i is the dependent variable which will correspond to the stock size in days, the cost of purchase of products and material over the last month, the total costs of operating the business over the last month, the total revenues generated from operating the business over the last month and finally the total profits generated over the last month. N_i stands for the individual risk attitudes of the risk entrepreneur; X_i is a set of observable individual characteristics such as age of entrepreneur, years of education, gender, poverty level measured using the family spending's per capita, number of employees working alongside the owner and business type and age. ε_i is the unobservable error term. Market fixed effects were included and standard errors were clustered across different markets as business outcomes in the same market may be correlated.

The reason why collecting information on poverty levels is crucial is that there could be a form of endogeneity caused by reverse causality. Even though we will not talk about causation in this paper, it is important to note that respondent might invest a lot in the lottery not because

[6] Respondents were asked to state how many days they were able to sell with the products they have in store on a normal day

[7] This was collected using a question asking whether the business was a « banca », « barraca » or « loja », this is an indicator of business size

they are risk loving, but because they are doing well and have a safe business. It is easier to invest more in a lottery when things are going well than when times are hard. Therefore, what we could be measuring are not the genuine risk attitudes but in fact the actual wealth of the respondent. We do not find any signs that could indicate that our results could be endogenous due to reverse causality[8].

5. Descriptive Statistics

Table 1 summarizes the main descriptive statistics of our sample. Our sample consists of 57.5 percent men and 42.5 percent women. This is mainly due to the exclusion criteria especially the one banning the vegetables and fruit sellers. On the overall population operating in those urban markets, there seemed to be more female micro-entrepreneurs than male, just like in many developing countries. The average micro-entrepreneur is just under 34 years old has completed a bit less than 8 years of education. They own their business since 8 years on average and have on average 0.29 employees. All our sample qualifies into the micro-enterprise category as they all have less than 10 employees. The average self-reported revenues were 28291.28 meticais and the average profits are -1332 meticais, the monthly spending by capita is around 1540 meticais. Concerning the hypothetical lottery, our risk measurement, respondents on average would invest[9] 470 meticais in the lottery and thus safely keep the difference. Stock size in terms of days had an average of 27 days.

Table 2 includes the main descriptive statistics about the respondent's characteristics and their relation to risk aversion. As found in many other papers, risk tolerance is strongly negatively correlated with being a female, we do not find correlations with age, education and poverty measurements. This is in line with the finding of Daniels (1992), among more recent

[8] Correlations between risk measurement and poverty measurement are presented in the Supplement. The sign is negative and far from significant. If there would a strong positive relationship, then we could be concern about reverse causality being an issue.

[9] Frequency histogram of the hypothetical measurement is available in the supplement file.

studies, that states that female entrepreneurs in Africa are more risk averse in comparison with their male counterparts.

6.Results

First of all, concerning, the stock management practices, there is evidence of a strong significant correlation between risk attitudes and the number of days' entrepreneurs are able to sell with the stock they have in store on a normal day as portrayed by Table 3. "Risk averse" individuals can sell more than 9 days less than their more risk tolerant counterparts. Individuals qualifying as "Risk loving" individuals, on the other hand, can sell approximately 4 days longer than the others. On average micro-entrepreneurs of our sample can sell 27 days with their normal stock. This could be evidence of a higher investment in terms of stock size being made by more risk tolerant micro-entrepreneurs. A more risk averse individual would make smaller but more frequent investment in comparison with the others.

We also find evidence of a relationship between the Purchase of good and materials[10] and risk attitudes. As said earlier, stronger investments from more risk tolerant entrepreneurs should increase the amount of goods and materials purchased by the entrepreneur, and we should thus see a relationship between risk attitudes and the amount of goods and materials purchased. This is precisely what we can see from Table 4.

We further expand the scope of our analysis with Table 5 by looking at the relationship between risk attitudes and total costs. We find a strong evidence of a relationship between risk attitudes and total costs, but also with the risk loving and risk averse dummies. We show results using the log of the monthly last costs and also the monthly last costs by deleting outliers[11]. Risk Loving individuals seem to have on average total costs of 6318 meticais above their more

[10] We look at the relationship with Product Purchases and Material cost because it is what matters most in our analysis and according to our model, the results on the other costs variables are available in the Supplement. The relationship between risk attitudes is significant only with Personal Transportation costs.
[11] 2 SD away from the mean

risk averse counterparts. More importantly for us, the Risk Averse individuals have an average total costs of 4166 meticais less than their more risk loving counterparts.

Table 6 shows the simultaneous quantile regressions between the monthly costs and risk attitudes, the significance strongly lies in the in the first two quantiles, thus for the entrepreneurs with the lowest total costs. This is in line with our theory stating that risk averse individual are stuck into low scale entrepreneurship due to their risk aversion.

We further expand our analysis of revenues. The investment in products and costs and business size should mechanically increase the revenues. The last monthly revenues and last monthly costs are not surprisingly very correlated, and our measure of risk attitudes should be as well if our theory is true. This is precisely what we can see from Table 7, monthly reported revenues are also very strongly positively correlated with risk attitudes, as they were the monthly cost. On average, people belonging to the risk loving category have revenues 10000 meticais higher than their more risk averse counterparts.

Table 8 shows the simultaneous quantile regressions of last monthly revenues and risk attitudes; the relationship is significant for all the quantiles ranging from 30 percent until 80 percent with the exception of the 60 percent quantile. This tells us that risk attitudes and revenues are correlated for all micro-entrepreneurs except the relatively poorer (0 to 30 percentiles) and the richest 10% of her sample. The coefficient of the effect tends to increase with the revenues. Interestingly, the age of the entrepreneur is correlated with more revenues (but also more costs) only for the lower half of our sample.

We finalize our analysis by looking at the relationship between risk attitudes and profits. Our results confirm the mixed results obtained in the psychology and the management literature

that states that there is no strong linear relationship between risk attitudes and business profitability as we find no correlation of profits and risk attitudes[12].

7. Discussion of results

All in all, our paper provides a detailed analysis of the role of risk attitudes of micro-entrepreneurs on their business performance while controlling for a number of factors. Using a detailed recent dataset, we are able to go deeper in our analysis than what psychological research has done so far by exploring the relationship of risk attitudes not solely with revenues, but also with total and specific costs, business management practices, and profits. Our work shows that risk attitudes are strongly related to the way micro-entrepreneurs manage their stocks, purchase goods and materials but also to their aggregate costs and revenues, suggesting that risk attitudes play a central role in micro-enterprise growth. The more risk tolerant entrepreneurs are more likely than their counterparts to invest in their businesses and grow the scale of their activities. This comforts our theory that suggests that risk averse entrepreneurs are stuck into entrepreneurship due to a lack of plausible alternatives. We do not however find any correlation between risk attitudes and profits.

In this context, and as a consequence of our results, subject to further replication in different contexts, a good policy intervention to promote private sector development could be to promote the training of micro-entrepreneurs in ways that illustrate the potential benefits of investment and risk tolerance in general. An important additional caveat to this policy prescription is related to the fact that our results are consistent with the hypothesis that some of the micro-entrepreneurs keep their businesses running because of a lack of alternative opportunities, and not because they possess the necessary entrepreneurial traits for success. These "forced entrepreneurs" might be less receptive to policy intervention.

[12] The table is available in the supplement, the coefficient is negative but not significant.

Another caveat comes from the fact that influencing individual's risk attitudes is likely to be hard to achieve. Indeed, risk attitudes are said to be stable over time, as shown by Jaeger et al (2010) in the context of migration. Moreover, Dohmen et al. (2006) find that risk attitudes are deeply anchored into individuals and that the risk attitudes of individuals are even transmitted from generation to generation.

Our results suffer from a few limitations. First of all, we rely on self-reported business outcome data from entrepreneurs that in an overwhelming majority do not record even basic accounting measures, and thus the reliability of the data can be questionable. Moreover, if our model holds, we should find more evidence of a relationship between risk attitudes and the diversity of products as increased investments in this sector will generally mean offering a stronger variety of products. We unfortunately lack the data to be able to check if this relationship exists.

In further research, it would be interesting to see if the results hold when using a non-hypothetical i.e. incentivized risk measure. Dohmen et al (2011) show that there is a correlation between the hypothesized and the incentivized measure using the German Socio-Economic Panel (SOEP) sample. This might however not be the case in our setting. Micro-entrepreneurs in low-income countries could value the money more and hence invest less in the lottery since their level of income is drastically lower than in Germany where Dohmen et al (2011) validated the measurements.

While we have shown that risk attitudes seem important for micro-entrepreneurship, and that risk aversion may be detrimental to business expansion, further research could study the impact of loss aversion. Caliendo et al (2010) argue that entrepreneurs might stay away from risky investments after a loss i.e. a failed investment was made. Some respondents of our sample might in fact be loss-averse rather than what is captured with our measurement as risk aversion.

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Table 1: Descriptive Statistics

VARIABLES	Obs	Mean/Proportion	Std Deviation	Min	Max
Female	431	0.42	-	0	1
Age	430	33.82	9.15	16	59
Education (years)	430	7.81	3.01	0	14
Number of Employees	459	0.29	0.75	0	5
Risk Measurement	232	4.70	3.98	0	10
Stocks (days)	397	27.22	61.43	0	500
Purchase of products (last month) (MT)	386	27552.93	62270.23	0	750000
Total Last month Costs (MT)	409	29472.42	62438.35	120	754464
Last Month Revenues (MT)	374	28291.29	70532	300	1160000
Last Month Profits (MT)	349	-1331.802	43463.73	-281700	405536
Monthly Family Spending Per Capita (MT)	450	1542.01	1296.72	16.66	15250
Years since Business Creation	456	8	6.88	0	33

Table 2: Risk attitudes and descriptive Statistics

VARIABLES	(1) Risk Measure
Female	-1.938***
	(0.572)
Family Spending Per Capita (log)	-0.150
	(0.267)
Years of education	0.0554
	(0.100)
Age of entrepreneurs	0.0428
	(0.0330)
Business Age	0.00692*
	(0.00396)
Business Type	0.0507
	(0.343)
Constant	4.526*
	(2.396)
Observations	226
R-squared	0.062

Robust standard errors in parentheses Note: Standard errors are robust and clustered by market. Market fixed effects were included.
*** p<0.01, ** p<0.05, * p<0.1

Table 3: Regressions on Stock Size

VARIABLES	(1) Stock (days) (sq)	(2) Stock (days)	(3) Stock (days)	(4) Stock (days)
Risk Measure	0.173**	1.144***		
	(0.0691)	(0.328)		
Being Risk Averse			-9.526***	
			(2.317)	
Being Risk Loving				3.933*
				(2.007)
Number of employees	-0.161	-0.253	-0.437	-0.771
	(0.382)	(1.811)	(0.958)	(1.026)
Business Age	-0.00154***	-0.0162***	-0.00452	-0.00601
	(0.000500)	(0.00200)	(0.00927)	(0.0101)
Business Type	-0.107	3.120	3.051*	3.317*
	(0.454)	(2.740)	(1.724)	(1.606)
Last month revenues (log)	0.133	-0.332	0.920	0.806
	(0.369)	(2.578)	(1.001)	(1.139)
Constant	2.186	10.43	4.699	2.914
	(3.156)	(23.37)	(9.302)	(10.42)
Observations	179	173	336	336
R-squared	0.216	0.204	0.165	0.141

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: Standard errors are robust and clustered by market. Market fixed effects were included. In (1), we use the square root of the dependent variable. In (2), (3), (4) outliers 2 standard deviations away from the mean of the dependent variable were excluded.

Table 4: Regressions on the Purchase of Products and Materials

VARIABLES	(1) Purchase of Products & Material (log)	(2) Purchase of Products & Material (log)	(3) Purchase of Products & Material (log)
Risk Measure	0.0267*		
	(0.0140)		
Being Risk Averse		-0.117	
		(0.133)	
Being Risk Loving			0.441***
			(0.114)
Female	0.0349	0.0695	0.105
	(0.209)	(0.123)	(0.144)
Family Spending Per Capita (log)	0.109	0.101	0.105
	(0.135)	(0.0937)	(0.100)
Business Type	0.0735	0.311**	0.312**
	(0.206)	(0.126)	(0.120)
Business Age	0.0561**	0.0268	0.0236
	(0.0223)	(0.0175)	(0.0180)
Constant	7.739***	7.778***	7.668***
	(1.094)	(0.659)	(0.671)
Observations	196	389	389
R-squared	0.166	0.141	0.150

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: Standard errors are robust and clustered by market. Market fixed effects were included. In (1), (2) and (3), we use the logarithm of the dependent variable.

Table 5: Regression on costs

VARIABLES	(1) Last month costs (log)	(2) Last month costs	(3) Last month costs	(4) Last month costs
Risk Measure	0.0517**	730.8*		
	(0.0200)	(380.3)		
Being Risk Averse			-4,166**	
			(1,819)	
Being Risk Loving				6,318*
				(3,471)
Age of entrepreneur	0.0231**	175.6	69.01	89.96
	(0.00918)	(157.0)	(92.29)	(98.51)
Family Spending Per Capita (log)	0.0308	1,523	1,325	1,267
	(0.0979)	(1,469)	(1,180)	(1,102)
Years of education	0.0638**	255.0	254.8	314.6
	(0.0284)	(394.4)	(360.3)	(377.4)
Business Type	0.124	172.2	1,777	1,872
	(0.116)	(2,830)	(1,795)	(1,772)
Business Age	-0.00239***	-15.53***	-14.48**	-18.79***
	(0.000232)	(3.786)	(6.048)	(5.084)
Constant	7.527***	-3,224	2,745	98.08
	(1.123)	(14,007)	(9,427)	(8,752)
Observations	213	204	407	407
R-squared	0.140	0.119	0.094	0.101

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: Standard errors are robust and clustered by market. Market fixed effects were included. In (1), we use the logarithm of the dependent variable. In (2), (3), (4) outliers 2 standard deviations away from the mean of the dependent variable were excluded.

Table 6: Simultaneous quantile regression on costs

VARIABLES	last month costs (log)								
	q10	q20	q30	q40	q50	q60	q70	q80	q90
Risk Measure	0.119***	0.0605***	0.0316	0.0432	0.0320	0.0311	0.0475*	0.0449	0.00790
	(0.0395)	(0.0231)	(0.0267)	(0.0311)	(0.0243)	(0.0246)	(0.0260)	(0.0304)	(0.0496)
Age of entrepreneur	0.0408***	0.0375**	0.0300**	0.0242*	0.0284***	0.0225**	0.0210	0.0137	-0.00843
	(0.0152)	(0.0148)	(0.0117)	(0.0134)	(0.00945)	(0.0112)	(0.0142)	(0.0137)	(0.0220)
Family Spending Per Capita (log)	-0.165	-0.134	-0.0661	0.00240	0.122*	0.155**	0.229***	0.134	0.359**
	(0.179)	(0.107)	(0.0796)	(0.0818)	(0.0659)	(0.0608)	(0.0808)	(0.120)	(0.146)
Years of education	0.0837	0.0745**	0.0707**	0.0731	0.0766*	0.0794**	0.0695**	0.0655**	0.0507
	(0.0551)	(0.0317)	(0.0306)	(0.0450)	(0.0395)	(0.0356)	(0.0349)	(0.0308)	(0.0652)
Constant	6.524***	7.324***	7.665***	7.590***	6.989***	7.124***	7.017***	8.204***	8.296***
	(1.415)	(1.021)	(0.802)	(0.933)	(0.670)	(0.721)	(0.892)	(1.054)	(1.504)
Observations	202	202	202	202	202	202	202	202	202

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 7: Regressions on revenues:

VARIABLES	(1) Last month revenues (log)	(2) Last month revenues	(3) Last month revenues	(4) Last month revenues
Risk Measure	0.0387*	1,324**		
	(0.0196)	(567.0)		
Being Risk Averse			-4,611	
			(3,538)	
Being Risk Loving				10,074**
				(4,804)
Age of entrepreneur	0.0106	55.38	-9.340	15.78
	(0.00712)	(159.4)	(117.2)	(124.4)
Family Spending Per Capita (log)	0.224**	2,555*	1,174	1,243
	(0.0869)	(1,261)	(1,223)	(1,223)
Years of education	0.0611**	475.4	443.9	447.1
	(0.0251)	(735.8)	(400.2)	(395.9)
Business Type	0.449***	5,555	6,815**	6,832***
	(0.116)	(3,509)	(2,544)	(2,341)
Business Age	-2.37e-05	-0.931	1.956	-4.443
	(0.000163)	(6.055)	(5.498)	(5.231)
Constant	6.197***	-19,839	-2,895	-6,568
	(0.705)	(12,979)	(11,057)	(9,738)
Observations	181	173	349	349
R-squared	0.356	0.263	0.196	0.218

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: Standard errors are robust and clustered by market. Market fixed effects were included. In (1), we use the logarithm of the dependent variable. In (2), (3), (4) outliers 2 standard deviations away from the mean of the dependent variable were excluded.

Table 8: Simultaneous quantile regression on revenues

VARIABLES	Last month revenues(log)								
	q10	q20	q30	q40	q50	q60	q70	q80	q90
Risk Measure	0.0413	0.0387	0.0657**	0.0474**	0.0430**	0.0356	0.0598*	0.0741**	0.0495
	(0.0328)	(0.0372)	(0.0321)	(0.0221)	(0.0196)	(0.0310)	(0.0345)	(0.0299)	(0.0355)
Age of entrepreneur	0.0384***	0.0311**	0.0288**	0.0247**	0.0335***	0.0186	0.0210	0.0167	0.0189
	(0.0130)	(0.0138)	(0.0123)	(0.0113)	(0.0125)	(0.0158)	(0.0156)	(0.0139)	(0.0142)
Years of education	0.162***	0.105**	0.0957**	0.133***	0.126***	0.104***	0.101***	0.108**	0.154**
	(0.0314)	(0.0493)	(0.0485)	(0.0395)	(0.0366)	(0.0331)	(0.0354)	(0.0460)	(0.0692)
Family Spending Per Capita (log)	0.215	0.162	0.248**	0.300***	0.249**	0.225**	0.251**	0.332***	0.230
	(0.168)	(0.136)	(0.113)	(0.105)	(0.0967)	(0.103)	(0.110)	(0.106)	(0.185)
Constant	3.978***	5.593***	5.280***	5.172***	5.472***	6.558***	6.530***	6.277***	6.984***
	(1.319)	(1.278)	(1.103)	(1.041)	(1.005)	(1.098)	(1.131)	(1.005)	(1.375)
Observations	181	181	181	181	181	181	181	181	181

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1